least I have not erred in supposing that a serious treatise on these topics is nothing else than the inevitable complement and conclusion of the slow process by which man has brought under the domain of science every group of attainable phenomena in turn—every group save this."

In the belief that this book marks an epoch in the history of psychical science, and that it will ultimately react with beneficial effect on the progress and enlargement of the scope of science generally, I venture to introduce this life-work of my friend to the readers of NATURE, or at least to such of them as are not already familiar with the subject.

OLIVER LODGE.

SCHOOL GEOMETRY REFORM.

A School Geometry. Parts i. and ii. By H. S. Hall, M.A., and F. H. Stevens, M.A. Pp. x + 140. (London: Macmillan and Co., Ltd., 1903.) Price 1*s.* 6*d.*

Experimental and Theoretical Course of Geometry. By A. T. Warren, M.A. Pp. viii+248. (Oxford: the Clarendon Press, 1903.) Price 2*s.*

Elementary Geometry. By Frank R. Barrell, M.A., B.Sc. Section i., part i., pp. xi +116. Price 1*s.* Section i., part ii., pp. vii+117 to 168. Price 1*s.* (London: Longmans, Green and Co., 1903.)

Solid Geometry. By Dr. Franz Hocevar. Translated and Adapted by C. Godfrey, M.A., and E. A. Price, B.A. Pp. vii + 80. (London: Adam and Charles Black, 1903.)

A PERSON may be a Cambridge Wrangler, and yet unable to make a simple graphical construction with accuracy. The ordinary schoolboy's knowledge of practical geometry is generally worthless or nil, and his knowledge of pure geometry, the result of his premature encounter with Euclid, is of like character.

But this state of affairs is being rapidly changed. As Messrs. Hall and Stevens say in the first volume of their new geometry, "The working of examples should be made as important a part of a lesson in geometry as it is so considered in arithmetic and algebra."

The book contains an excellent collection of easy graphical and deductive exercises, many of the examples requiring numerical answers. The latter are given at the end. A boy working through this course should acquire a working knowledge of geometry, and a fair insight into the methods of deductive logic.

The volume contains the substance of Euclid book i., and is based on the recommendations of the Mathematical Association; the sequence of Euclid is in the main adhered to. There are two parts, the latter dealing with areas. In this the experimental course is incorporated with the deductive exercises, and assigned equal importance with the latter. This is a good feature, and is to be continued in a further volume which the authors have in preparation. In the present case, it seems to be a defect that the plan has not been carried out to the same, or even a greater, extent in part i., which is concerned with lines, angles, and rectilineal figures. Here it would appear to be especially necessary to make the experimental course predominate. But the subject of school geometry is in a state of transition, and the authors have probably thought it well to proceed cautiously.

Mr. Warren's volume is also based on the report of the Committee of the Mathematical Association. The course includes the fundamental properties of the triangle and circle. Ratio and proportion, similar figures, and polygons are likewise considered. The experimental treatment occupies the first half of the book, and in the second half the same ground is covered, the propositions being formally established by deduction.

The two volumes by Mr. Barrell comprise the first of three sections of a new school geometry which, when complete, will extend to Euclid xi. and the mensuration of the simple geometrical solids. It is written in accordance with the new syllabus of the Cambridge Local Examinations, and the report of the Mathematical Association. Part i. is intended to take the place of Euclid, book i. Part ii. corresponds with Euclid, book iii., 1–34, and also includes a portion of book iv. In the treatment adopted, the experimental and practical course is worked in along with the deductive geometry, and is always made subordinate to the latter. We should like to see the demonstrative geometry relatively less prominent. A feature to be noticed is that the author gives three meanings of a plane angle, in the last of which the angle is regarded as the plane space swept out by a line of indefinite length (one way) turning about one end; the amount of turning is not the angle, but the measure of its magnitude. The author is right in stating that this conception is implied in many of Euclid's phrases. The numerical answers of lengths and areas are given to three significant figures, and of angles to the nearest ten minutes. In the latter case decimals of a degree would perhaps have been preferable.

The actual personal use of mathematical instruments for graphical computations is probably largely foreign to many of the authors of the new text-books, and the treatment suffers on this account. There must be much future development before any text-book can be allowed to become crystallised.

Now that the study of pure geometry is to include numerical as well as graphical computations, it may become necessary, and it is certainly very desirable, to introduce simple tables of functions of angles so as to be able to solve right angled triangles completely, instead of being restricted as at present to the property of complementary angles and the use of Euclid i., 47.

The "Solid Geometry" by Dr. Hocevar will illustrate how this branch of the subject is presented to youths in Germany. Chapters i. and ii. deal with the properties of the line and plane in space, and the solid angle, but in a much less formal manner than is the case in Euclid xi. The remaining chapters relate to the properties and mensuration of the prism, cylinder, pyramid, cone, sphere and regular polyhedra. Exercises are provided in great variety, chiefly of the numerical type, and all necessary answers are collected at the end of the volume, where the reader will also find a useful index.

The translators say that, as the course of elementary plane geometry will be shortened on account of recent changes, teachers will be able to introduce solid geometry at an earlier period than formerly. The choice of the best complete school course of geometry is a very important matter at the present time. We should like to see solid geometry taught in connection with projection, and think that the elementary geometry of vectors should be introduced.

SHIP'S MAGNETISM.

Elementary Manual for the Deviations of the Compass in Iron Ships. By E. W. Creak, C.B., F.R.S., Retired Captain R.N. Pp. xii+150; with 4 charts. (London: J. D. Potter, 1903.)

IN his preface the author explains that the present work aims at being the successor of the "Elementary Manual" by the late Sir F. J. Evans. It is

"intended for the use of seamen of the Royal Navy and Mercantile Marine and Navigation Schools, and as an introduction to the Admiralty Manual for the Deviations of the Compass."

After a table of contents, there is a short introduction embodying some elementary definitions. Sections i. and ii., pp. 1–25, give an elementary description of the properties of magnets, with illustrations intended to supply a general idea of the action of the earth as a magnet, followed by a brief account of the phenomena of terrestrial magnetism which are of most importance to navigators. Section iii., pp. 26–42, describes the ordinary "Thomson" and liquid compasses and various auxiliary instruments. It also describes that temple of accuracy the Compass Observatory at Deptford, and gives valuable advice on such practical matters as the storage of compass cards, and the choice of a site for the standard compass on board ship. Sections iv. to vi., pp. 43–108, are mainly technical.

Section iv. treats of the "swinging" of ships to determine the deviations of the compass. It describes the sources of change in the deviation, more especially the effects due to "heeling" of the ship and to change of geographical position. It also gives some interesting particulars as to the large changes of deviation produced by the firing of heavy guns in warships. Section v. describes the effects of "soft" and "hard" iron. It introduces the reader to semicircular and quadrantal deviation by describing experiments whereby analogous effects can be produced by magnets or by soft iron situated near a compass.

Section vi. associates different constants in the ordinary mathematical theory of ship's magnetism—which the reader of the work is apparently intended to consult in the Admiralty Manual—with the action of imaginary magnets occupying specified positions in the ship. It then takes the actual results obtained in swinging certain warships, and shows how to construct deviation tables from them. This is done with great minuteness, and should be specially valuable to those who are unable to master the theoretical part of the subject. Section vii., pp. 109–131, treats of hollow iron spheres, Flinders bars, and other means of mechanical correction of the compass. There is a short account of the Peichl quadrantal corrector, which the author considers specially adapted for the case of compasses in conning towers of warships, where the earth's horizontal force is generally much reduced by the action of the ship's own magnetism. Amongst some concluding notes the author mentions the highly magnetisable and the nearly unmagnetisable alloys of iron recently discussed by Prof. Barrett and Mr. Hadfield as having a possible future in connection with compass work.

At the end of the book are some tables and a copious index. Table i. serves to facilitate the calculation of deviation tables. Table ii. tabulates some elementary trigonometrical functions. Tables iii. and iv. embody recommendations as to the dimensions of soft iron spheres and Flinders bars most suitable for the correction of deviation errors of assigned magnitude. At the end are charts of the earth's isogonal and isoclinal lines, and the lines of equal horizontal and vertical force, calculated for the epoch 1905.

So far, at least, as warships are concerned, the author's practical knowledge of the subject is probably unrivalled, and the value of the book as a mine of experience is hardly likely to be questioned. On the theoretical side there is more room for two opinions. The author takes a very humble—it is sincerely to be hoped too humble—view of the mathematical attainments of British navigators. His attitude to theory is the very antithesis of that of Mascart in his recent "Magnetisme Terrestre" (chapter xiv.). Mathematical results are occasionally introduced by a statement which does not amount to a complete proof, but might be mistaken for one, when a proof could be given without assuming advanced mathematical knowledge. Various of the references to magnetic and general theory scattered throughout the book are also capable of more exact statement from a physical standpoint.

The fact that the author defines the C.G.S. units in his introduction, but sticks to inches and other British or wholly arbitrary units in his text and charts, affords food for reflection. In one or two sections of the book there seem an appreciable number of minor misprints, more especially in one or two of the numerical examples, and attention might usefully be given to their elimination in the probable event of a second edition of the work being called for. C. C.

OUR BOOK SHELF.

Encyclopaedia Biblica, a Critical Dictionary of the Literary, Political and Religious History, the Archaeology, Geography and Natural History of the Bible. Edited by the Rev. T. K. Cheyne, D.Litt., D.D., and J. Sutherland Black, M.A., LL.D. Vol. iv. Q to Z. Pp. xxxii+cols. 3989 to 5444. (A. and C. Black, 1903.)

THIS work, now completed, contains, as the publishers inform us, about as much printed matter as twelve volumes of the "Dictionary of National Biography." They have also published a thin-paper edition, which when bound in one volume is only about three inches thick. This encyclopædia has commanded for its